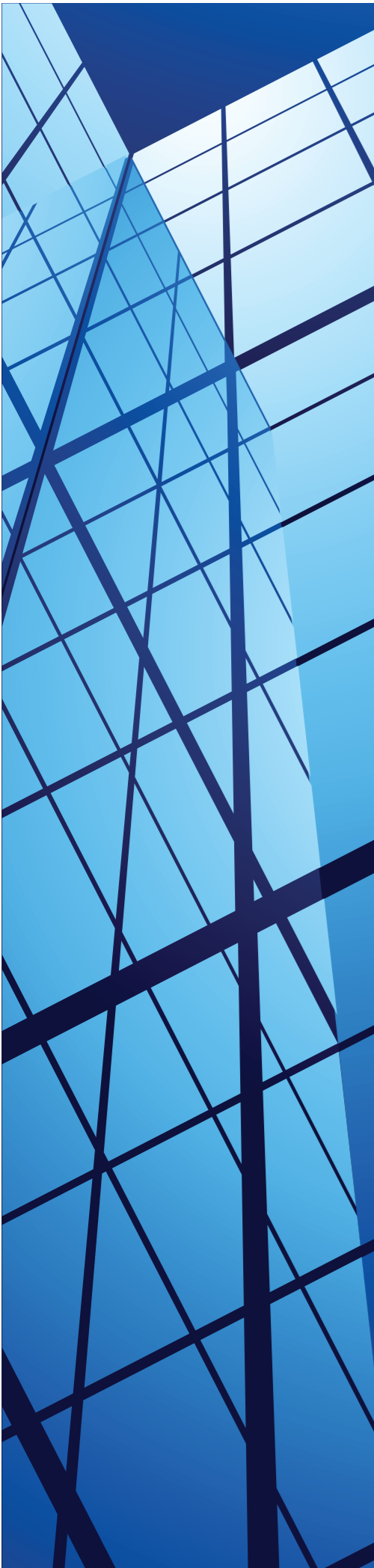


Symbolic photo

T CLASS  
WATER COOLED CHILLERS  
Oil-Free Centrifugal Chiller



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## INTRODUCTION

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### PROPRIETARY NOTICE

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### DOCUMENT PURPOSE

This catalogue provides a general overview of Smardt's T Class water cooled chiller range, including the key features and options available. It is intended as a general guide for the appropriate selection and application of T Class water cooled chiller units.

For specific application information, contact your nearest Smardt sales representative.

The information provided is general in nature, and is subject to change as part of Smardt's commitment to continuous product improvement.

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SMARDT CHILLER GROUP

Smardt is "Global Number One" in oil-free centrifugal chillers, with production facilities in Stuttgart, Germany; Melbourne, Australia; Plattsburgh, New York; Guangzhou, Guangdong and Montreal, Canada. Smardt service networks extend across the globe; they monitor and support the world's largest installed base of oil-free high-efficiency chillers (well over 5000 by the end of 2015). Smardt started a global reputation with the first oil-free centrifugal prototype built in 2002 to help refine Turbocor's compressor technology before its launch in 2003.

Smardt's lowest lifecycle costs make such a major contribution to an owner's long term values that they make chiller first cost differences largely irrelevant.

Since 2002, Smardt has built, tested and continually refined the world's widest oil-free chiller range. Water cooled high-efficiency chillers from 200 kW up to over 8 MW, air cooled chillers from 200 kW to 2 MW, adiabatic chillers to over 1 MW, modular, split, condenserless and other variations match a wide range of specific applications. Free cooling (standard coil or thermosyphon) and heat recovery applications are increasingly specified. The Smardt range covers a wide range of non-standard conditions, e.g. in fluids (glycols, brines and others). Increasing focus on low-GWP refrigerants is reflected in installed Smardt chillers in Switzerland and other countries. Smardt innovations have resulted in a number of patents and patent applications.

Unlike all other global chiller brands, Smardt's global innovation programs are wholly dedicated to Smardt customers and the value they earn from their Smardt chillers. In compressors, Smardt has been working closely with Turbocor since 2002 (Smardt founder Roger Richmond-Smith is also a founder of Turbocor), and the two companies continue to share detailed

test programs. In heat exchangers, Smardt's research work on metallurgy, corrosion resistance, flow and heat transfer management has led to several patents and patent applications. In systems integration and controls, Smardt software innovations mean major advances in operating efficiencies, effective redundancy and responsiveness. In service support, training, monitoring and continuous commissioning, Smardt programs continue to develop. Seamless optimisation of whole variable speed chiller plants using Smardt chillers shows further major gains in energy efficiency.

**SMARDT MARKETS ACHIEVING MAJOR ENERGY REDUCTIONS**

- DATA CENTRES  
(ESPECIALLY BANKING & OTHER FINANCIAL INSTITUTIONS)
- HOSPITALS & HEALTHCARE
- HOTELS
- PROCESS COOLING
- EDUCATIONAL & INSTITUTIONAL CAMPUSES
- CONCERT HALLS & OPERA HOUSES
- MARINE
- LARGE COMMERCIAL BUILDINGS
- DISTRICT COOLING SYSTEMS



**Smardt's range of T Class water cooled chillers has been designed to reliably deliver high operating efficiencies across a wide range of operating conditions.**

**It features a base range of models, each with extendable condensers and performance options, creating a multitude of combinations to suit any project requirement.**

Smardt have brought their extensive experience in oil-free chiller development, sales and service into designing the T Class Water – a range of water cooled chillers that deliver the highest level of reliability, outstanding efficiency, and the lowest total cost of ownership.

All Smardt chillers are designed to optimise the superior performance of oil-free compressors from Danfoss Turbocor, and the T Class Water is no exception. These compressors, coupled with our extendable condenser design, high efficiency evaporator, and industry-leading fan technology result in the highest efficiency water cooled chiller.

Our class leading performance and quality design ensures the best results for total equipment lifecycle operation and reliability.

The T Class Water range comes with the same benefits as all Smardt chillers, such as ease of installation, simplicity of operation and maintenance, and lower operating and maintenance costs.

**HIGHLIGHTS**

- Largest capacity range in oil-free water cooled chillers.
- Typically smaller footprint when compared with chillers of a comparable capacity.
- Responsive chilled water control in all conditions.
- Inbuilt redundancy with multiple compressors.
- Class leading part load efficiencies, achieving the highest IPLV in total capacity range.
- Designed for ease of maintenance and serviceability, featuring field-serviceable compressors.
- Dual-turbine compression technology, coupled with an economiser, delivering class leading performance
- Germany manufactured, acceptance tested and pre-commissioned prior to delivery ensuring trouble-free commissioning and startup on every project.

**The T Class Water features a high efficiency, extendable condenser, with multiple performance options built around a compact, yet robust structural frame**

**OIL-FREE COMPRESSOR TECHNOLOGY**

At the core of all Smardt chillers is an oil-free Danfoss Turbocor compressor, featuring magnetic bearing technology. With no oil to compromise heat exchanger performance, and no friction losses associated with conventional compressor bearings, Smardt chillers are able to achieve exceptional full- and part-load efficiencies.

This ultra high speed technology eliminates up to 99% of compressor induced vibrations, and dramatically reduces the sound levels emitted by the chiller.

**ENVIRONMENTALLY RESPONSIBLE**

All T Class Water chillers use R134a refrigerant as standard, which has no ozone-depletion potential, is non-toxic, non-harmful and has no phase-out schedule per the Montreal protocol.

Additional ultra-low GWP refrigerant options are also available.

**PACKAGED CONSTRUCTION**

All Smardt chillers are factory assembled and tested, ensuring trouble free start up and commissioning.

**DURABLE FRAME CONSTRUCTION**

The T Class Water features a rigid, truss-like frame that has been constructed from structural sections, then hot-dip galvanized to provide premium protection.

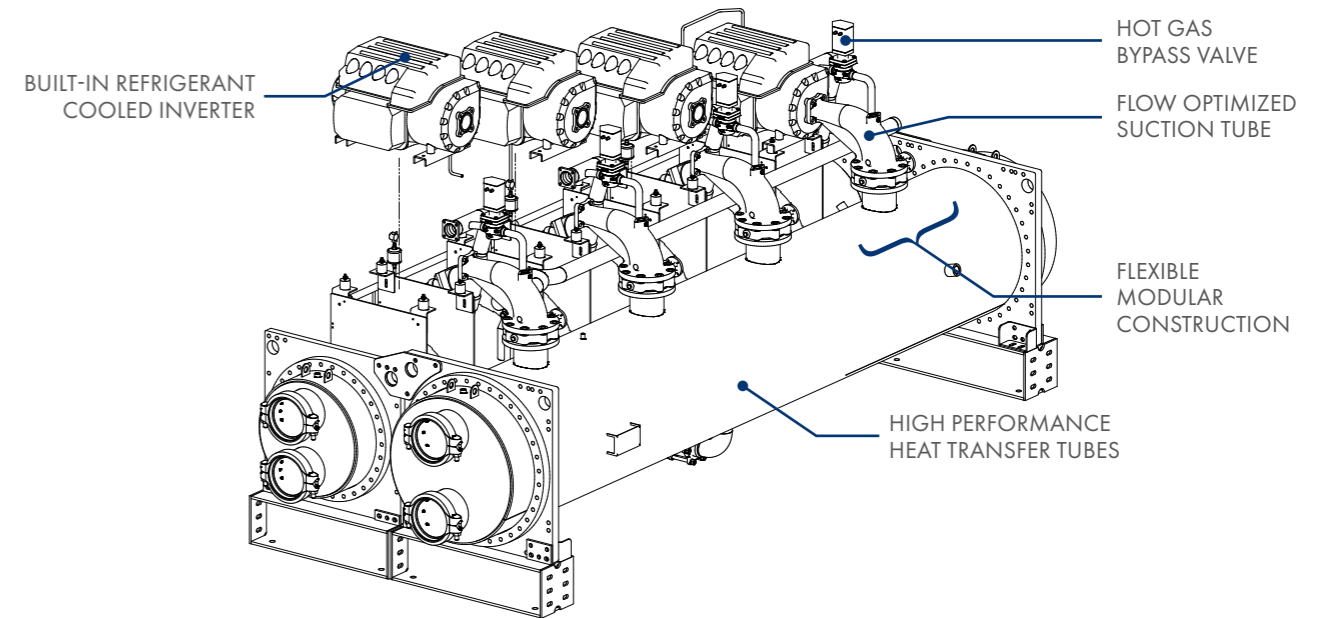
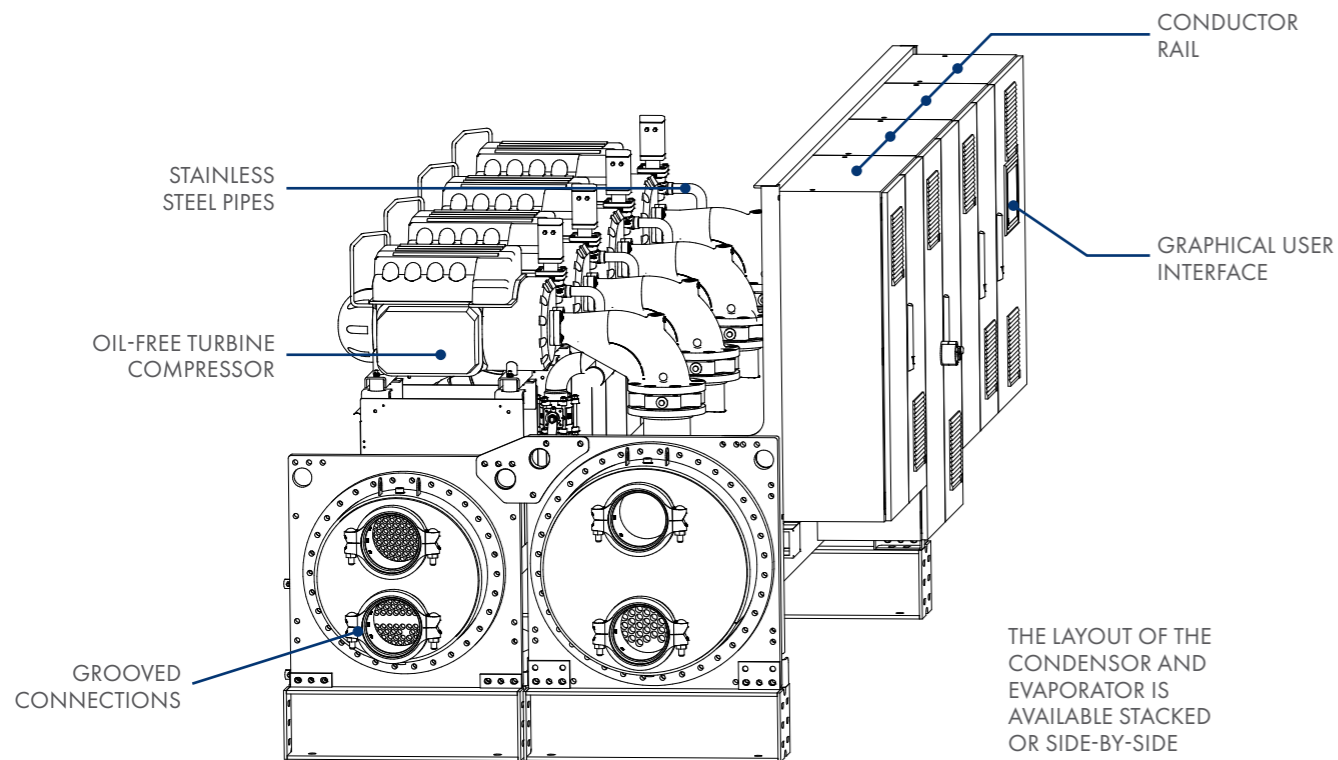
This design provides a strong and durable frame for worry-free lifting, installation and longevity.

**HIGH EFFICIENCY**

All Smardt chillers use a premium flooded shell and tube heat exchanger which has superior efficiency and reliability to plate and frame or DX heat exchangers.

**COMPACT**

T Class chillers offer a small footprint, when compared with oil-free chillers of a comparable capacity. Through the use of larger capacity compressors, in place of multiple smaller compressors, chilled water plants can now experience the efficiency of oil free without sacrificing space.



**ADAPTABLE BY DESIGN**

The configuration of each T Class Water base model is extremely flexible in performance and footprint, and can be adapted to suit any water-cooled application.

The T Class Water extendable condenser design allows for a range of different efficiency options based on job location, application and critical operating environment.

In addition, an extensive range of performance, functional and connectivity options are offered – all specific to project application and customer requirements.

**CONTROL SYSTEM**

Proven across years of industry experience in oil free chiller operation, Smardt's advanced chiller controller is designed to optimize the performance & capabilities of the T Class Water chiller range. Capacity can be reduced to as little as 10% of full-load capacity (for some models).

Simple integration with building management systems via MODBUS RTU is provided as standard.

**CONTROL PANEL WEB-BASED**

The Smardt Control provides a web-based alternative to traditional hardware controls. The web panel combined with the touch screen display gives the customer both the ease-of-use of a traditional control panel and the flexibility of a web panel.

The web panel software is installed on the chiller, while the user interface can be accessed from my device (f. i. cell phones, tablets or computers) running a web browser and that have access to the local network. Switching between different control panels is as easy as following a web link.

To access remotely, Smardt offers the modem connection possibility as an option. This way, my device connected to the internet can, through an user password, connect to the chiller.

**SERVICEABILITY**

All Smardt chillers include refrigerant isolation valves on both sides of all serviceable components as standard. This facilitates servicing without the need to pump down the entire unit, and in most cases can be undertaken while the chiller remains operational.

The majority of serviceable components are readily accessible from the perimeter of the unit, with each compressor accessed using the quick-release latches on its weather resistant cover.

The controller interface is conveniently housed in a separate lockable enclosure located between condenser coils where it is shielded from rain and sun glare (depending on the version).

**RELIABILITY & REDUNDANCY**

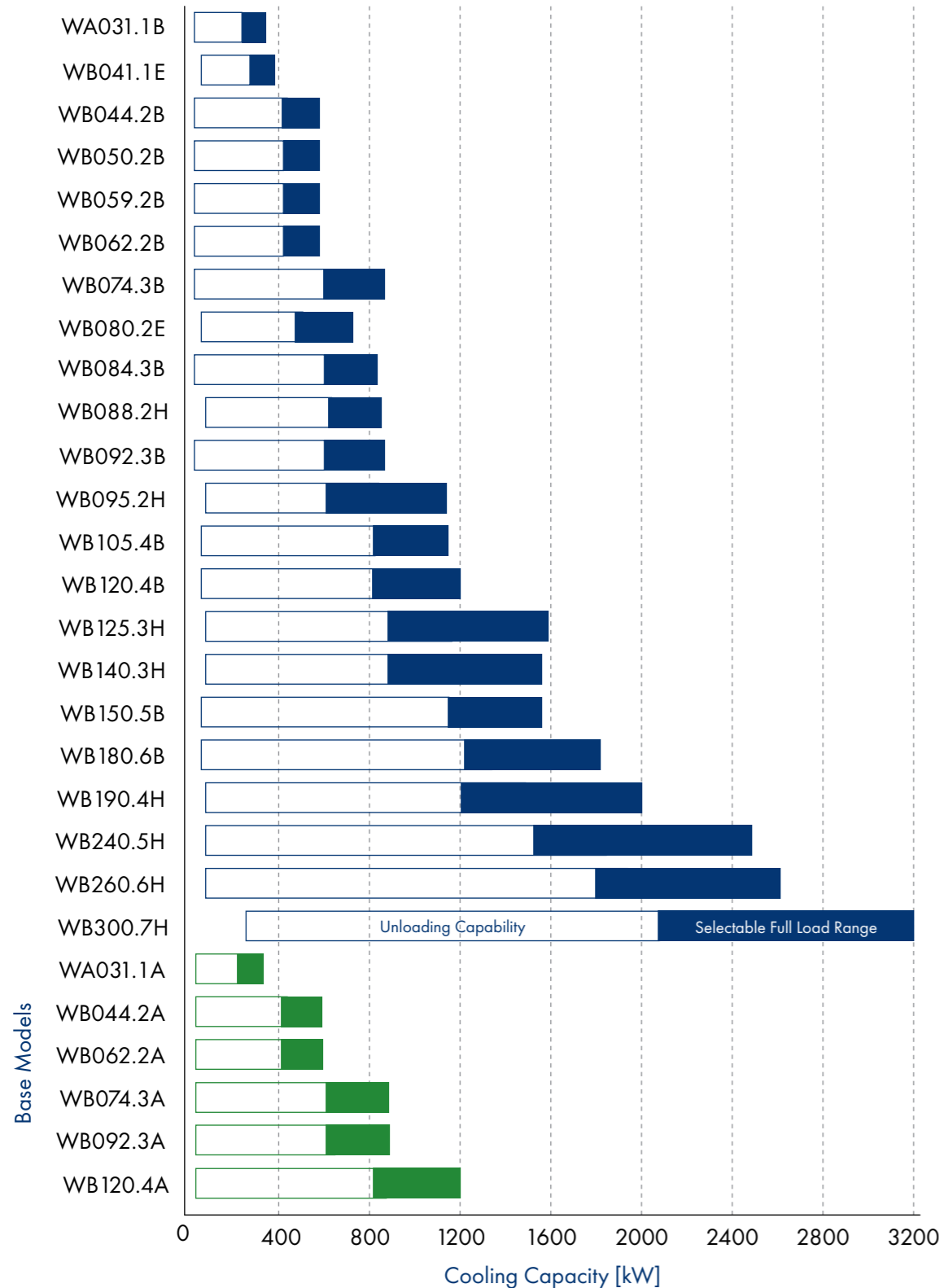
With the experience of more than 5000 oil-free centrifugal chillers now installed worldwide, Smardt chillers offer outstanding reliability – unsurprising when an estimated 80% of all chiller field problems relate to failures in the compressor oil-return.

On multiple-compressor models, mechanical and electrical isolation provides significant redundancy and failsafes. In the event of a compressor outage, Smardt's controller will automatically adjust its logic to continue serving the chilled water load with the remaining available compressors. Should a compressor require servicing, it can be quickly & easily isolated, even removed, without stopping the chiller.

## CAPACITY RANGE

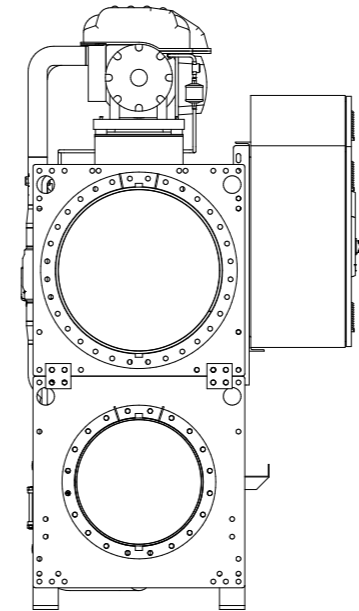


The T Class range has been designed to meet a wide variety of applications, with full load capacities ranging from 300kWR up to 3200kWR.

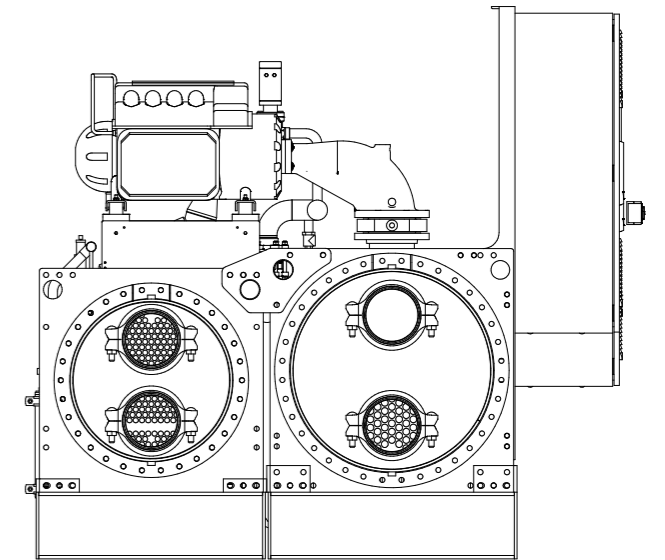


Note: Available cooling capacity will vary with operating conditions and chiller configuration. Capacities shown are based on standard Eurovent conditions.

## AVAILABLE OPTIONS



STACKED LAYOUT



SIDE-BY-SIDE LAYOUT

### ECONOMISERS

Economisers are available on all models, which extend the capacity of the chiller and/or further increase its operating efficiency.

### ALTERNATIVE INSULATION

All models are fitted with 19mm [3/4"] closed-cell rubber, wrapped in 3 mm thick UV stabilised insertion rubber, as standard. 38 mm rubber, aluminium cladding, 50 mm polystyrene and 50 mm polyurethane options are also available.

### FLANGED CONNECTIONS

Grooved connections are supplied as standard on all models. Flanged options are available on request.

### STAINLESS STEEL ENCLOSURES

All TA Class electrical enclosures are powder-coated. For additional protection, powder-coated stainless steel enclosures can also be requested.

### ULTRA-LOW GWP REFRIGERANT

As an option we can offer the chiller filled with the ultra-low GWP refrigerant R1234ze.

### CONDENSER PROTECTION

Stainless steel tubesheets and waterboxes are available to extend the service life of your chiller, even in severe environments.

For extreme environments, Copper/Nickel and Titanium heat exchanger tube materials can also be specified.

Anodic and cathodic protection options are also available.

### WATER CONNECTIONS

Grooved connections are supplied as standard on all models. Flanged options, including AS Table 'E' and ANSI #150, are available on request.

Marine waterboxes are also available on all T Class units.

### HIGH-LEVEL COMMUNICATIONS

Modbus TCP/IP, BACNET IP, Profibus, LON, SBUS and REMOTE communication options are available as alternatives to MODBUS RTU, which is included as standard.

### POWER MONITORING

An integrated monitoring system, providing absolute power usage & quality in real time over HLI.

## CHILLED WATER REQUIREMENTS

All external pipework must be self-supporting, and aligned to prevent strain and distortion on the chiller's headers and couplings.

## EVAPORATOR WATER CIRCUITS

The chiller performance and efficiency can be adversely affected by contaminants in the water circuit. As such, strainers should be located on the inlet side of the evaporator.

The water circuit should be arranged so that the pumps discharge through the evaporator, with the return water to the chiller connected to the lower connection of the evaporator.

## CHILLED WATER TEMPERATURE LIMITS

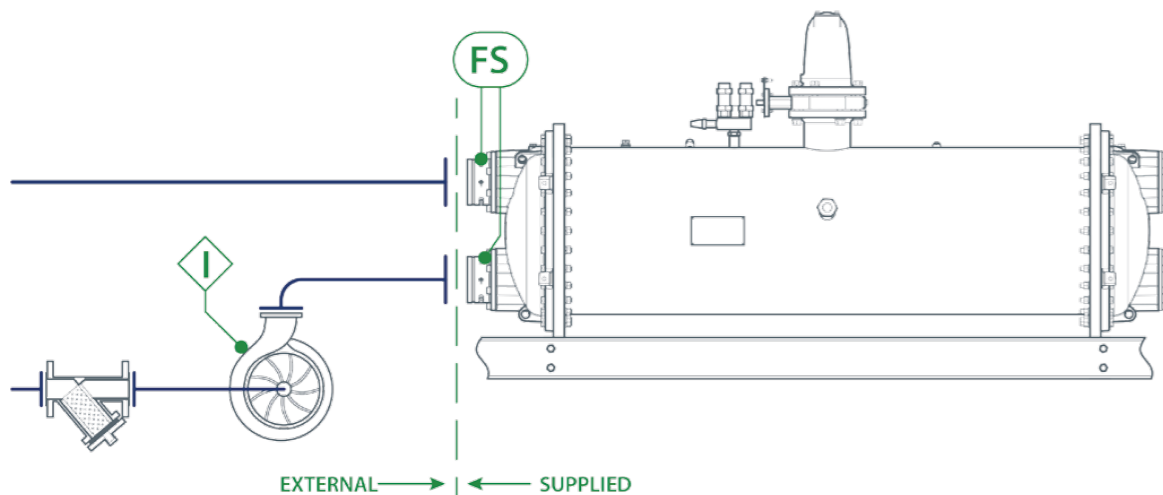
T Class Water chillers are optimised for chilled water temperatures between 4°C and 22°C. For applications outside this range, please consult your local sales representative.

## FLOW SAFETY INTERLOCKS

Flow switches (FS) are fitted as standard on all Smardt chillers, which enables the chiller to shutdown in the event of low or high flow through the evaporator.

An additional field-supplied chilled water pump interlock, or a VSD interlock signal are required on all installations.

If the chiller is intended for an application using variable chilled water flow, please confirm the appropriate cut off point with Smardt.



# INSTALLATION REQUIREMENTS

## MOUNTING REQUIREMENTS

The chiller shall be installed on a flat surface, with a minimum of 75 mm flange width around the perimeter of the base frame. Refer to individual product information for these dimensions.

Waffle pads can be used in place of spring mounts for most installations requiring structural isolation.

## DESCRIPTION

Microprocessor controlled, electric water chiller using HFC-134a or R-1234ze refrigerant, oil free, two stage centrifugal variable speed compressor and high efficiency corrosion resistant condenser.

## QUALITY ASSURANCE

Construction shall comply with relevant European codes; vessels shall be manufactured in accordance with PED code. Selected units can be run tested at the factory prior to shipment (functional testing without water in the shell; optional).

## COMPRESSOR(S)

The compressor(s) shall be an OIL FREE semi-hermetic two stage direct driven variable speed centrifugal. Compressor(s) shall be equipped with discharge and suction shutoff (isolating) valves for mechanical isolation as standard.

Capacity control shall be provided by variable speed drive and inlet guide vanes, capable of reducing unit capacity to below 15% of full load.

Compressor shall start unloaded and current inrush shall be limited by control to less than 5 amps. Motor cooling shall be provided by an integrated liquid refrigerant injection system controlled by the compressor(s). The compressor(s) shall require no oil lubrication.

Compressors shall be housed in weatherproof ABS plastic enclosures with quick release covers which when removed provide full access for servicing requirements.

## EVAPORATOR AND CONDENSOR

Provide shell and tube design with seamless copper tubes mechanically expanded into boiler quality mild steel tube sheets with mild steel water boxes. Form the shell from carbon steel plate, designed, tested and stamped in accordance with PED and CE safety codes for unfired pressure vessels. Rate the water tubes to a pressure to suit the installation but in any case be not less than 10 bar.

Insulate the shells with 19 mm closed cell PVC nitrile rubber sponge and further wrap with 1.5 mm thick insertion rubber.

Provide a water drain connection and single bulb well for low temperature cut-out, load limit thermostat, and temperature controller.

## REFRIGERATION COMPONENTS

Pressure Relief Valves shall be provided on the evaporator in a paired assembly to allow for either to be isolated without the introduction of any safety hazard.

Each compressor shall be fitted with Discharge and Suction isolation valves. Electronic Expansion and Level Sensors valves shall be provided.

Evaporator shall be fitted with a sight glass to allow for visual inspection of the tubes.

## STANDARD CONTROLS, INTERLOCKS & SAFETIES

Provide and mount in the chiller set control cubicle the interlocks, time delays, relays, surge controls, capacity control, safety controls, relays, connections for interlocks with external pumps and flow switches and the like necessary for safe and satisfactory operation and for restarting the chiller set immediately upon restoration of interrupted power supply.

Unit controls shall include the following minimum components:

- Microprocessor control with non-volatile memory.
- Power and control circuit terminal blocks.
- ON/OFF control switch.
- Temperature sensors installed to measure cooler entering and leaving fluid temperatures.
- Sensors for suction and discharge pressure and temperature.
- EMI filters class A (one per compressor)

Unit controls shall include the following functions as standard:

- Capacity control based on leaving or entering chilled water temperature with set point offset load compensation.
- Rate of change control at start up to prevent overshoot.
- Auto restart after power failure.
- The web-based control panel shall include a 8 inch, clear backlit, colour LCD touch screen with menu driven user interface for setting of user set points and options, and for providing operating information descriptions.

Unit controls shall include the following display variables as part of the user interface:

- General operational data including; entering and leaving chilled water temperatures, chilled water set point, ambient air temperature, time and date, active timers, system demand, chiller status, active faults and alarms.
- Compressor data including; communication integrity, active alarms, actual compressor(s) demand, impeller speed, IGV position, active pressure ratio, suction pressure, discharge pressure, active power input, desired power input, 3 phase Amps, surge RPM, choke RPM.
- The control system shall allow software upgrade without the need for new hardware.

The controller shall include contacts for interfacing to the building management system and standard communication protocol: MODBUS RTU for the following functions: Summary fault, Start/Stop, Chilled water flow interlock, Chiller water reset, Demand limit.

Unit shall be equipped to provide the following protection:

- Loss of refrigerant charge.
- Low chilled water temperature.
- Power supply error.
- Compressor motor thermal or electrical overload.
- Phase loss.
- High and low pressure.
- Loss of chilled water flow.

## ELECTRICAL

Unit primary electrical power supply shall enter the unit at a single location.

Unit shall operate on 3-phase power at 400 volts, 50Hz.

Control voltage shall be 24VDC.

Unit shall be shipped with factory control and power wiring installed. Power factor shall be greater than 0.9 (compressors only) at full design load. Provide EMI filtration for high frequencies EMC compliance.

High impedance reactors providing enhanced low frequency harmonic mitigation.



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